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GLAS Flight Software Product Plan

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Flight Software Branch
Code 582.0

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Signatures

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Geoscience Laser Altimeter System (GLAS) CM Plan

Document Change Record

Revision	Description of Change	Pages Affected	Date	Approval
-	Baseline Release of Document	All	7/29/99	*RF*
A	Incorporate Changes per GLAS-CCR-027.	All	10/15/99	*RF*

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Version Date: 07/28/1999

1 Introduction

This document is intended to describe the plan for the development of the Geoscience Laser Altimeter System (GLAS) Flight Software. This Document shall be the basis for formal agreements between the GLAS Project and the GLAS Flight Software Team.

The requirement to have a Product Plan was levied January 1999 after the team had started the development phase.

1.1 Purpose

The purpose of the GLAS Flight Software effort is to design, integrate and test the GLAS Flight Software that will allow the instrument to fulfill its mission requirements.

1.2 Background

GLAS is a laser altimeter instrument that will be flown on the Ice, Clouds and Elevation Satellite (ICESat) being built by Ball Aerospace and Technologies Corp. of Boulder Colorado. GLAS consists of three distinct data streams from 9 detectors. The three(3) data streams are from the altimeter digitizer, the cloud digitizer and the photon counter (or lidar). The altimeter digitizer and cloud digitizer share the same (redundant) detector and the photon counter has 8 Single Photon Counting Module (SPCM) detectors. GLAS receives commands and sends housekeeping telemetry to the spacecraft bus via a mil-std-1553 bus. GLAS outputs science telemetry data to a recorder via a semi-custom parallel RS-422 interface. GLAS contains two microcomputers: a Synova Mongoose V Radiation Hardened 32-bit processor running at 12.5 MHz (derived from a MIPS LR33000) and an Analog Devices ADSP 21020 Digital Signal Processor running at 25 MHz. The majority of the GLAS flight software runs on the Mongoose V processor. The DSP processor is used to process the Altimeter Digitizer data.

1.3 Product Plan review and update

This document shall be reviewed by members of the GLAS project including the Project Manager, the Instrument Systems Engineer, the Electrical Systems Engineer and the Main Electronics Unit Lead Engineer. Furthermore, the Flight Software Branch managers shall review it. Approval signatures shall be obtained from the GLAS Instrument Manager and the Flight Software Branch Head.

This document has been developed by and shall be maintained by the GLAS Flight Software Lead. It may be updated to reflect changes in the project objectives.

2 Customer Agreement

This section describes the agreement between the GLAS Flight Software customer and the GLAS Flight Software development team including those issues related to requirements, deliverables, and maintenance.

2.1 Customer(s) Identification

The primary customer for the GLAS Flight Software is Code 924, The Laser Remote Sensing Branch who is responsible for the development of the GLAS instrument. The project has relevancy to the Earth Science Enterprise as defined in the NASA strategic plan.

2.2 Customer Goals and Objectives

The customer's objective with respect to the GLAS Flight Software is to be provided with flight software to manage on-board command, control, and data collection for the GLAS Instrument. This software runs on both the Mongoose V and DSP processors within the GLAS instrument. The customer expects reliable and tested software, suitable for use in a space flight environment.

2.3 Requirements

The GLAS Flight Software will provide the GLAS Instrument with functions for control of the hardware subsystems, collection of engineering and science data and processing of commands. A detailed requirements document will be created as one of the first steps in the software development effort. The software requirements document will be accessible on the internet at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ . The current version of the requirements document is ver 1.1 and the data is 1-15-1999.

The requirements document will be controlled and approved in accordance with the GLAS CM Plan.

2.4 Deliverables

The products to be delivered by the conclusion of this project include the flight software executables, the source code, the build level test procedures, and instrument level test procedures. In addition, supporting documentation, including requirements document, design review package, and user's guide will be delivered.

2.5 Necessary customer training

The customer or its designated representatives will be trained in Instrument configuration and calibration procedures, normal operating procedures, and troubleshooting procedures. The training shall be informal and consist of on the job training plus a presentation that will summarize all procedures.

2.6 Medium for product delivery

The product will be delivered to the customer by being directly loaded into the GLAS Electronics box computers. Source Code and other documentation will be delivered electronically in text, PDF or HTML format (as applicable) on a CD-ROM or Zip Disk.

2.7 Product destination

The GLAS Flight Software executable product destination is the GLAS Main Electronics Unit (MEU) Computers. There are various users of the source code and other documentation, including the maintenance team, the science processing team, the satellite operations team and others. To simplify the distribution of the documentation it shall be made available via a World Wide Web Server at NASA/GSFC.

2.8 Post delivery maintenance

Maintenance of the GLAS Flight Software will be the responsibility of the GLAS Flight Software development team until launch. During this period, all modifications to the GLAS Flight Software needed to address bug fixes, enhancements, and upgrades will be performed by or managed by the GLAS Flight Software development team.

After launch, maintenance will be handled by a CSC subcontract that handles flight software maintenance for various other 582.0 products. The responsible government official will be Mike Oben, Code 582.0.

2.9 Customer supplied elements

This section describes those elements of the GLAS Flight Software development effort that are to be supplied by the customer.

2.9.1 Funding

The customer shall provide all funding necessary to complete the project. This includes funding for all hardware, software, personnel, and equipment required for the project.

2.9.2 Information and Support

The customer shall be the primary point of contact for the development of a detailed list of requirements and functional specifications. Throughout the development of the GLAS Flight Software the customer will continue to serve as a point of contact for questions regarding detailed requirements and operation concepts. The customer shall review all flight software documentation, including requirements and design reports.

The Customer or its designated representative will have primary responsibility to provide the GLAS Flight Software team with the following Interface Control Documents:

Ball to GLAS Interface Control Document (1553 and SSR)
GPS to GLAS Interface Control Document

GLAS Flight Software team members will be required to help draft and define these interfaces but the ultimate responsibility for getting the information will be the customer's.

2.10 Customer involvement

This section describes the involvement of customer personnel that will be required to insure that the product delivered meets the requirements.

2.10.1 GLAS Instrument Manager

Ronald Follas, SSAI/Code 924 (ronald.b.follas.1@gsfc.nasa.gov)

The GLAS Instrument Manager is responsible for establishing the requirements to be met by the effort. In addition, it is the Instrument Manager who has final authority over the acceptability of the deliverable and will approve of change in scope, acceptability of levels of risk, and modifications to schedule.

2.10.2 GLAS Instrument System Engineer

Dr. Eleanor A. Ketchum, Code 730.0 (eleanor.a.ketchum.1@gsfc.nasa.gov)

The GLAS Instrument System Engineer is the primary point of contact for technical issues regarding the GLAS Instrument. She provides guidance with respect to the specific technical performance of the flight software against the requirements specified by the GLAS Instrument Manager.

2.11 Customer communications

Communication with the customer will be carried out in a variety of forms. The GLAS Flight Software Lead will make regular contact with the customer in order to report status, bring up development issues, and discuss design decisions. The GLAS Flight Software Lead will also attend regularly scheduled GLAS

Leads meetings. The customer will be invited to attend a software design review, which will be held during the first half of the software development cycle.

2.12 Authority for changes

All changes to the requirements for the project required or requested by the customer should be forwarded to GLAS Flight Software development team in writing via a CCB Configuration Change Request. Electronic forwarding of requirements changes via e-mail is preferred. All change requests shall be evaluated by the development team who shall determine if the change can be provided. If changes in requirements will result in a change in the software development cost or schedule, the customer will be informed of the estimated impact promptly.

The GLAS CCB will be the final authority for changes that affect schedule, cost or interfaces.
All changes to the design or implementation of the project required or requested by the GLAS Flight Software development team that may have cost or schedule impacts will be forwarded to the customer in writing. Written authorization for or concurrence with the proposed change by the customer will be required.

2.13 Acceptance criteria

The product will be determined to be complete when it is accepted by the customer. A formal release form signed by GLAS Flight Software Lead Engineer, the Instrument Systems Engineer and the Project Manager will become a part of the project's quality records.

Supporting evidence of the product's readiness for acceptance will be provided by the GLAS Flight Software development team. Build test and acceptance test plans will be created by the development team and approved by the customer. Test reports will be issued by the development team after the completion of each test phase. A functional test procedure will be created by the development team, and executed by the customer on the integrated spacecraft hardware.

2.14 Customer Agreement review and update process

Changes to the requirements may be initiated by either the customer or the development team. All changes must be requested using the GLAS software problem/change reporting system found on the C&DH software web page at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ Requested changes will be reviewed and must be approved by both the customer and the development team before they are implemented. The problem/change system will be used to track the requested changes.

3 Management Approach

This section describes the management approach that will be employed in the GLAS Flight Software Development effort.

3.1 General development approach

A team of Flight Software Developers will be assembled in order to develop, integrate and test the GLAS Flight Software. Team members will include both civil servants and contractor personnel, with some shared personnel with the EO-1 WARP Project. The civil servant team will consist of Code 582 Software engineers.

The general development approach for the GLAS Flight Software will maximize the reuse of previously developed flight software for C&DH systems, particularly the software for the MIDEX MAP and EO-1 WARP missions.

3.2 Resources needed

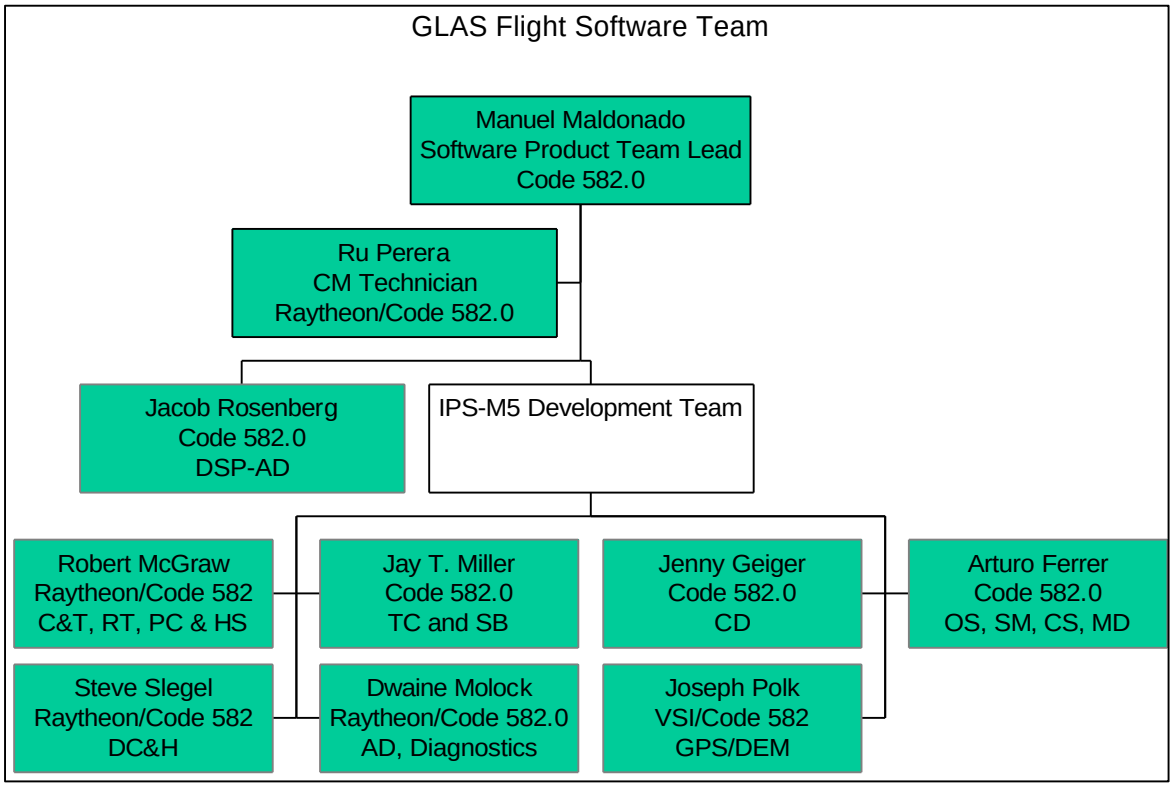
The development of the GLAS Flight Software is expected to include one nearly full-time NASA employee and five part time employees. Contractor support will also be required. These resources are formally requested and described in the code 582 Statement of Work.

3.3 Team Organization

This section describes the organization and purpose of the GLAS Flight Software Development Team. The GLAS Flight Software Development Team consists both of civil servants and contractor personnel. The contractor personnel for GLAS have been selected based on their experience and specific knowledge of the software architecture to be used. This architecture was implemented on MAP and EO-1 WARP and is the basis for GLAS. Given the schedule their contribution is critical to making timely deliveries.

3.3.1 Organization Chart

The following chart depicts the organization of the GLAS Flight Software Development Team.



3.3.2 Team Charter

The GLAS Flight Software Development Team will provide the GLAS Instrument with flight software that supports the following functions: control of instrument hardware subsystems, collection of engineering and science telemetry, running altimeter digitizer algorithms and commands distribution.

3.3.3 Team Scope

The GLAS Flight Software Development Team will procure and/or develop all hardware and software necessary for the GLAS Software Development laboratories. The team will design, integrate, test and document all of the GLAS Flight Software . The team will provide support up to launch + 120 days to the Instrument and ICESat Spacecraft Operations teams.

3.3.4 Roles, Responsibilities, Authority, Accountability

This section describes the roles and responsibilities of the members and supporting organizations associated with the GLAS Flight Software development.

3.3.4.1 GLAS Flight Software Product Lead

Manuel D. Maldonado, Code 582.0(manuel.maldonado@gsfc.nasa.gov)
The GLAS Flight Software Product Lead is responsible for the design, development, testing and deployment of the GLAS Flight Software. In addition the GLAS Flight Software Lead will provide documentation of the product, status reports as required and demonstrations of progress as available.

3.3.4.2 GLAS Flight Software Developers

The GLAS Software developers are responsible for supporting the GLAS Flight Software Lead in the design, construction, testing and deployment of the GLAS flight software. In addition, the GLAS Flight Software developers must provide documentation of the product, status reports as required and demonstration of progress as available. The GLAS Flight Software Team Lead will assign each developer responsibility for developing and testing one or more software subsystems. The current list of software subsystems to developer assignments is documented below. Changes to these assignments can be made by the GLAS Flight Software Lead and will be documented via e-mail and at biweekly GLAS Flight Software meetings.

Arturo Ferrer, Code 582.0, (arturo.ferrer@gsfc.nasa.gov) is assigned to the Operating System, Software Manager, Memory Dwell and Checksum Software
Jenny Geiger, Code 582.0, (jennifer.geiger@gsfc.nasa.gov) is assigned to the Cloud Digitizer Software.
Jack Rosenberg, Code 582.0, (jacob.rosenberg@gsfc.nasa.gov) is assigned to the DSP- Altimeter Digitizer Software.
Todd Miller, Code 582.0, (jay.miller@gsfc.nasa.gov) is assigned to the Time Code and Software Bus Software.
Joe Polk, VSI, (joseph.polk@gsfc.nasa.gov) is assigned the GPS/DEM Software
Robert McGraw, Raytheon, (robert.mcgraw@gsfc.nasa.gov) is assigned the Health and Safety, Remote Terminal, Photon Counter and Command & Telemetry Bus Software
Dwaine Molock, Raytheon, (dwaine.molock@gsfc.nasa.gov) is assigned the M5-Diagnostics. DSP-Diagnostics, DSP Bootstrap and IPS-Altimeter Digitizer Software
Steve Slegel, Raytheon, (steve.slegel@gsfc.nasa.gov) is assigned the Data Collection and Handling Software.

3.3.4.3 Flight Software Branch

Code 582, The Flight Software Branch, as the AETD provider of engineering support for this project, will provide organizational support for all aspects of the development effort. This support may include generalized development tools and development environments, documentation support, development computers, related training if available within the branch, augmentation of resource levels as required for development, internal reviews or audits.

3.3.5 Decision making and conflict resolution process

Design decisions related to the GLAS Flight Software will be made by all members of the development team. In the event of a conflict, the GLAS Flight Software Product Lead will have the final decision making authority.

3.3.6 External support

Contractor support has been obtained for all phases of the project, through the MEDS Contractor QSS for contractor personnel from Raytheon and VSI. The contractor personnel shall report to the GLAS Flight Software Product Lead.

3.4 Team interfaces to other groups

The members of the GLAS Flight Software Development team will interface with many groups within the GLAS, Ball Aerospace and ICESat organizations. The primary interfaces are with the GLAS Systems Engineer, The GLAS Electronics Team Lead and The ICESat (Ball Aerospace) Spacecraft Systems Engineer. For hardware interfaces an interface control document defining the data and command interfaces between the hardware and the flight software will be generated by the GLAS Electronics Lead Engineer and approved by a representative of the software and hardware teams.

3.5 Development Facilities

The GLAS Flight Software will be integrated with breadboard and engineering model hardware in building 14, room N291, which is the GLAS Flight Software Laboratory. This space has been provided by Code 582. Design and coding will occur both in the GLAS Flight Software Laboratory and in the offices of the individual developers.

3.5.1 Modifications of existing facilities and schedules

There are no required or planned physical modifications to the GLAS Flight Software Laboratory.

3.5.2 Development of new facilities and schedules

No new facilities are needed for the GLAS Flight Software development effort.

3.5.3 Physical security

The GLAS Flight Software Laboratory requires card key access to enter. All government computers are password protected and on a government owned network.

3.6 Procurement

This section describes the purchases planned for the project.

3.6.1 Procurement Needs and Dates

Item	Quantity	Unit Cost	Cost	Expected Purchase Date
Pentium II Class NT Workstations (Lab)	2	$4,000	$8,000	Sept 1, 1998
Pentium Class Computers (Simulators)	2	$2,500	$5,000	Sept 1, 1998
ROM Emulators	2	$2,000	$4,000	Sept 1, 1998
Laser Printer	1	$1,500	$1,500	Sept 1, 1998
StarBase CM Software Server version	1	$4,000	$4,000	Sept 1, 1998
Starbase CM Software Workstation version	6	$400	$2,400	Sept 1, 1998
Starbase Maintenance package	1	$700	$700	Sept 1, 1998
VxWorks Operating System	1	$35,000	$35,000	Jan 1, 1998
Logic Analyzer Reverse Assembler	1	$1,000	$1,000	Sept 1, 1998
Misc. Software Development Tools			$20,000	As needed
		Total	$81,600.00	

Note: As of this writing all of the above described major procurements have occurred. At this stage miscellaneous software development tools are the only items that occasionally need to be procured.

3.6.2 Reference procurement process

All procurements will be made using the approved Center-wide procurement process. Purchases of hardware and/or software costing more than $2500.00 will be accomplished using the Small Purchases System (SPS). Purchases of hardware and/or software costing less than $2500.00 will be accomplished as a credit card purchase by an approved government credit card holder. All purchases will be compliant with Federal Acquisition Regulations.

3.7 Team training plan

All team members will take ESD Training at the operator level. Any member that will take part in Instrument level Integration and Test activities (in building 7) will take Laser User Certification training.

3.8 Risk mitigation

There are a number of risk factors associated with this effort. Management of these risks is the responsibility of the GLAS Flight Software Product Lead in conjunction with the other members of the development team. The major risk is the schedule. The schedule for delivery of the GLAS Flight Software is aggressive. Mitigation of risk is anticipated by the extensive re-use of the software developed for the MAP and EO-1 (WARP) missions and by the development team's drawing on their experience from previous Software Development efforts.

3.9 Schedule

The GLAS Flight Software Development schedule showing the key steps and milestones associated with the development effort is included on the GLAS web page at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under documents.

In addition the GLAS Project keeps a master schedule for all of GLAS subsystems which is managed by John Davis, (John.A.Davis.1@gsfc.nasa.gov). Mr. Davis can be reached at 301 286-4393.

3.10 List of all controlled documentation including quality records

The following documents will be the controlled documentation for GLAS:

GLAS Flight Software Product Plan
GLAS Flight Software Requirements Document
GLAS Flight Software Build Test Plan
GLAS Flight Software Build Test Results
GLAS Flight Software Acceptance Test Plan
GLAS Flight Software Acceptance Test Results
GLAS Flight Software Design and User's Guide

The list of quality records is kept on the GLAS web page at:
http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under documents.

3.11 Process for process and product metric analysis

The process of the GLAS Flight Software development effort will be analyzed through regular reviews of the schedule, budget, and status of the subsystem.

A group of metrics will be collected and reported during the software development process as required in Appendix E of the ISC Product Development Handbook. These metrics will be maintained on the GLAS web page http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ .

4 Technical Approach

The section describes the technical approach that will be used to develop the GLAS Flight Software.

4.1 Software Development Plan

The approach to the development of the GLAS Flight Software will be to maximize the use of commercial off the shelf and reuse of MAP/EO-1 WARP Software. This will minimize the amount of code to be written. Other software development will be accomplished using available software development techniques.

A GLAS Flight Software development plan was written for GLAS around May 1998 and is available on the GLAS web page: http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/.

4.1.1 Major Activities

This section describes the major activities planned in the development of the GLAS Flight Software. Several phases and products of the effort have been identified. For more information see the GLAS Flight Software web site.

4.1.1.1 Phases

The development of flight software will include the following phases: Requirements, Design, Development, Integration and Test, and operations. Detailed requirements for all elements of the flight software will be gathered during the Requirements phase. The design of the system will be developed in the Design phase. The Development phase will include coding and subsystem build testing. During Integration and Test, the flight software will be integrated with other subsystems and tested against the

requirements on Engineering /Test Unit (ETU) and flight hardware. Operations consist of launch support, and on orbit control.

4.1.1.2 Products associated with phases

The Requirements phase will be completed when the Requirements document is completed and accepted.

The Design phase will be completed when the design review charts have been developed and presented at the project C&DH Software Design Review. Reviewer comments will be addressed prior to the completion of this phase.

The Development phase will be completed when the hardware and software needed for the project has been obtained and integrated into the development system and the final build tests have been successfully completed. The Design/User's Guide will be completed during this phase.

The Integration and Test phase will be completed when the Acceptance Test Plan has been implemented and completed successfully, and the customer and the Flight Software Lead have signed the release form.

4.1.2 Development methodology

This section describes the methodology that will be employed in the development of this product.

4.1.2.1 Methodology

The GLAS Flight Software will be developed using a structured decomposition and design approach. The programming paradigm can be summarized as:
1 Find the Top, 2- Find the next Level, 3- Find more levels until you are done.

Another way to describe this is to continually partition the problem space into functions and decompose these functions until they are small or trivial enough to be coded.

4.1.2.2 Development environment – target machine(s) and programming languages

The Development environment will consist of Windows 95/98/NT host machines. The target processors are the IPS Mongoose V board and the DSP Processors. Both are in the Main Electronics Unit.

The development language shall be ANSI C. Some operating system low level routines will be written in MIPS LR33000 and ADSP-21020 assembly language.

4.1.2.3 Utilized Standards

The CCSDS standards will be used in the GLAS Flight Software. In particular CCSDS packet structures will be used for commands and telemetry. The current revisions of these standards can be found at http://www.ccsds.org/ccsds/blue_books.html

GLAS will use the MIDEX MAP Flight Software Coding Standards written by David McComas dated 7-22-1996 and available at http://fs735-nt.gsfc.nasa.gov:8001/dr/midex/docindex.htf

4.1.2.4 Utilized COTS products and tools associated with building the products

WindRiver Tornado and VxWorks 5.3 will be used for the real time operating system function.

WindRiver provided GNU Tools will be used for compiling, linking and converting the source code into an executable.

4.1.2.5 Build Strategy

See section 3 of the document GLAS Flight Software Development Plan, June 18, 1998. This document can be seen at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under GLAS Software Documents.

4.1.2.6 Product inspection and test approach

The GLAS Flight Software will be tested in three phases. A unit test will be performed on all modules. These tests will be developed and performed by the software developers. A build test will be performed following the releases 1, 2 and 3 of the software. The GLAS Flight Software development team will perform these tests based on a functional build test plan that validates functional requirements. Acceptance tests will be performed as the last verification of the software prior to GLAS environmental testing. A team composed of software developers and flight software maintenance personnel will perform acceptance testing. The acceptance test procedures will be comprised of build tests procedures and additional tests simulating GLAS operational scenarios.

A GLAS Flight Software Test Plan will be written and will be available at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under GLAS Software Documents.

4.1.2.7 Acceptance criteria and objectives

A requirements /test matrix will be developed as part of the acceptance test plan to show how each subsystem's requirements are being verified. When complete the detailed plan may be reviewed at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under GLAS Software Documents

4.1.2.8 Reviews planned

In general, the number of reviews required for the development and testing of the GLAS Flight Software will be kept to a minimum. Software subsystems or tests which are heavily re-used from previous missions will be subject to fewer reviews. Software subsystems which are newly designed for GLAS will be subject to the full review process. The full review process includes the following reviews:

- GLAS Flight Software Requirements/Architecture Review *(October 1998)*
- GLAS Flight Software Critical Design Review *(September 1999)*
- GLAS Flight Software Subsystem Requirements Review *(for AD, CD, PC, DC and GP subsystems)*
- GLAS Flight Software Subsystem Design and Code Review *(for AD, CD, PC, DC and GP subsystems)*
- GLAS Flight Software Subsystem Build Test Reviews *(for all subsystems)*

4.1.3 Incoming inspection and test

No inspection other than kind, count and condition of purchased products is planned.

The Receiving, Inspection and Test System (RITS) will be used to record any purchases of equipment that is either part of the flight product, interfaces to flight product, or used to verify the flight product.

4.1.4 Control of test equipment

Ground Support Equipment (GSE) and other test equipment are maintained by the group that provided it. Integration on flight hardware provides the final basis for product acceptance. Use of software test equipment is only an interim test until the target hardware is available. Therefore no calibration other than kind, count, and condition of the software test equipment is required.

4.2 Process for transportation, identification, and medium of product

The NASA/GSFC standard process for transportation will be used to transport COTS purchased products. Each release of the GLAS Flight Software will be identified through the release form as stated in section 5.3.1. The medium of the product is stated in section 2.6.

4.3 Technology and commercialization plan

There is no technology and commercialization plan.

4.4 Servicing – Process for product maintenance

Servicing of all COTS hardware and software will be covered under the respective product warranties. A maintenance contract for the VxWorks operating system will be obtained and continued throughout the development process. See section 2.8 for a description of the maintenance process for the flight software.

5 Product Assurance

This section describes the processes and procedures that will be followed in order to assure that the product developed satisfies the customer's requirements.

5.1 Assumptions and Constraints

It is assumed that all COTS products will meet or exceed all specifications included in the purchase request.

5.2 Quality Assurance

This section describes the processes and procedures that will be followed in order to assure that the customer receives a quality product.

5.2.1 Control of nonconforming products

During the development phase, reports of nonconformance will be reviewed, tracked, and maintained by the development team. An on-line problem/enhancement database system has been set up at: http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ under submit/locate a problem report. Any problem or enhancement that impacts the schedule, budget, and delivery of the product will be assessed by the development team and reported to the customer. After delivery of the flight software to spacecraft I&T, non-conforming products will be reported using the NASA/GSFC NCR/CA system .
The Flight Software development team will maintain changes made to the system in response to a nonconformance report.

The customer will have the authority to use or refuse to use the product in an operational environment.

5.2.2 Corrective and preventative action

Errors in process will be reported using the NASA/GSFC NCR/CA system. Reports of nonconformance will be reviewed, tracked, and maintained by the development team. An assessment of the impact of the nonconformance to the schedule, budget, and delivery of the product will be made by the development team and reported to the customer.

5.2.3 Control of quality records

Quality records will be maintained and monthly updates to the quality records list will be provided to the GLAS Project Office in Code 924.0. The Quality Records custodian for the GLAS Instrument is Karen Mitchell, Karen.D.Mitchell.1@gsfc.nasa.gov and can be reached at 301- 614-6713.

All quality records associated with the GLAS Flight Software development effort will be under the authority of the GLAS Flight Software Lead. The actual day to day gathering and physical record keeping of these records will be done by the Configuration Management Technician, Ru Perera.

5.2.4 Control of documents and data

All internal documents generated by the Flight Software team are controlled by the Flight Software Lead. All deliverable documents identified in section 3.10 will be controlled by the GLAS Project Configuration Management Officer.

5.3 Configuration management

Configuration management procedures will be applied to all components delivered or developed during this effort. Subsequent builds or deliveries will result in incremental versions of the system. Changes to archived or installed software following the initial delivery must be requested using the Discrepancy report (Problem Report) form on the GLAS Flight Software web page at http://fs735-nt.gsfc.nasa.gov:8001/dr/glas/ . The Flight Software development team will review all changes. An estimate of the schedule and budget necessary to effect the requested change will be made and presented to the customer. Implementation of changes will be done according to the priority defined by project management.

An electronic configuration management system will be implemented for GLAS Flight Software Product. The system will be implemented using StarBase StartTeam 3.0 on an NT4.0 server.

All software, documentation, software tools and build procedures will be configured and regularly backed up on a software development file server.

5.3.1 Identification and traceability of product.

TBD

5.3.2 Control of Customer Supplied Elements

No Customer Supplied Elements will be used in the software laboratory for software development or verification.

6 Plan Update History

Version	Date	Description	Affected Sections
1.0	February 15, 1999	Original	All
1.1	March 17, 1999	Additional sections completed.	All
1.2	July 7, 1999	Additional sections completed	All
1.3	August 13, 1999	Minor changes in GLAS Instrument description, GLAS Instrument Manager title, names. Change support duration to launch + 120 days.	1.2, 2.3, 2.10, 3.3.3 and 5.3